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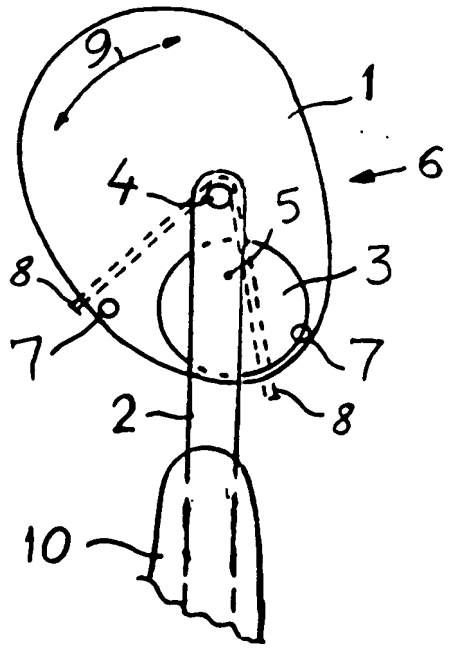
(54) Title: HEADREST

(57) Abstract

A headrest for seats in a vehicle or a different transportation means. The headrest includes a light head cushion (1) and a heavier, movable element (3), which both are fastened to the vehicle's chassis in a movable manner. The headrest also includes a mechanical connection (6), e.g. in the shape of at least one gear wheel (11) and threaded surfaces connected to the head cushion (1) and to the movable element (3), which mechanical connection (6) interlinks the heavy element (3) and the easy head cushion (1) in such a manner that when the heavy body (3) is accelerated, e.g. due to a collision, then the lighter head cushion (1) will move but in the opposite direction. According to one specific embodiment of the invention the head cushion may also be provided with a one-way acting attenuator which results in an easy movement of the head cushion in one direction, while a returning movement towards the rest position only takes place against a substantial attenuation or friction force. The object of the invention in particular is to provide a dynamic head rest which due to mass forces caused by, e.g. a collision, automatically reduces the distance between the head of the user and the headrest, and accordingly reduces neck damage.



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HEADREST

The present invention relates to a headrest and in particular to a headrest including a head cushion fastened to a frame structure which in turn is fastened to the chassis of a vehicle or to a similar transportation means.

Conventionally many different types of head cushions to support the user's head have been used in connection with different transportation means such as cars, fast going boats, aeroplanes, transportable derricks etc.

Such head cushions are partly made to give the user a comfortable position during use; without unnecessary strain on neck muscles; partly to protect the user against damages during heavy accelerations which may, e.g. be caused by collisions. The term acceleration here refers to all types of changes of the velocity. Thus, the term acceleration will also include retardation during heavy braking or collisions.

Most of the earlier known headrests are firmly mounted to the back of a chair which in turn is fixedly mounted to the chassis. Usually the headrest is also mounted so that the user does not lean his head on the cushion during normal use of the transportation means, but sits with his head at a distance from the headrest during normal use. Accordingly the user, e.g. during a collision from astern, has his head forcibly pushed aback until the headrest is hit. At this time the damage may already be a fact, partly due to a relatively strong strain on the neck vertebras and partly due to the situation that the head travels a rather long distance and therefor obtains a correspondingly high velocity at the accelerations in question during a collision.

The object of this invention is to provide a new dynamic head rest which automatically is moved closer to the user's head when a collision occurs, so that both the distance over which the head is accelerated, and the speed of the head during this acceleration, are reduced substantially.

This is obtained by using a headrest according to the below stated claims.

The most specific features of the headrest according to the present invention is that the head cushion itself is light while it is mechanically interlinked to a substantially heavier mass which is movably suspended relative to the chassis. The mechanical coupling between this heavier mass and the headrest then is accomplished in such a manner that when the heavier mass accelerates due to an accident, the mechanical coupling transmits this movement to the headrest, which then is moved towards the user's head in an automatic manner.

According to a preferred embodiment of this invention, the heavier mass and also the headrest itself, makes up a free, swinging pendulum, preferably with mechanical limitation of the swinging movement.

According to the invention the headrest may also be mechanically biased in such a manner that it will return to a predetermined position when the chassis becomes quiet.

Finally the head cushion may be provided with a one-way acting friction or attenuation device. Such an attenuation device will give the result that the head cushion moves fast and with little or non resistance towards the head in the moment of collision, while the head cushion not at all or slowly returns to the start position. This one-way acting attenuation device ensures that the head cushion gives an extra good protection during collisions from astern, as the cushion will act approximately as a completely fastened headrest, but it will be brought close to the head in the moment of collision and this movement will be controlled by the collision itself.

To give a better understanding of the present invention it is referred to the more detailed description below describing some examples of embodiments, and to the accompanying drawings in which:

Fig. 1 illustrates a simple embodiment of the invention built as a pendulum,

Fig. 2 shows a different embodiment of the invention using a translating movement of the cushion and a gear exchange in the transmission,

Fig. 3 shows an embodiment in which the heavi r mass is

made up by the seat itself, possibly including the user, and

Fig. 4 shows an embodiment substantially in accordance with Fig. 1, but in addition comprising a one-way acting attenuation device.

It is pointed out that the same reference numbers are used on the different figures when found convenient, that many details of construction are omitted on the figures to make the principle more clear, and that the figures substantially are drawings depicting the principle, and that the scale not necessarily is the same within one figure or on different figures.

In Fig. 1 the headrest comprises a head cushion 1 fastened to a frame structure 2 which in turn is firmly mounted to the back rest 10 which in turn may be fastened to a chassis, e.g. the chassis of a car.

The head cushion 1 is pivotally fastened to an axis 4 in such a manner that the head cushion 1 may tip as assumed by the arrow 9. It should be noted that the main body of the head cushion 1 is made up from a rigid but light material, while the head cushion in its lower end is provided with a heavy weight or body 3, which preferably may be integrated in the head cushion 1 along its complete width. According to this cushion 1 and the heavier body 3 will together make up a pendulum, which acts as one mechanical device 6. On the figure the cross section of the heavier element 3 is shown as a circle, i.e. circularly cylindric across to the paper plane, but different shapes of the cross section are of course also within the scope of the invention.

In addition the tiltable head cushion 1 may be provided with stops such as 7 on the figure. When these stops hit upon firm constructional elements such as the frame structure 2 when pivoting, the angular tilting of the head cushion 1 will be limited. Such end stops may be designed in many different manners. With the embodiment referred to above, the pendulum embodiment, the end stops may, e.g. be a portion of a strong angular structure 8 being firmly mounted within the head cushion 1, e.g. arranged around and possibly fastened to the axis 4, and will limit the angular tilting

of the cushion 1 as the angle is designed in such a manner that its end parts will stop against the frame structure 2 during tilting. However, different embodiments of the end stoppers may be used, e.g. as the end stoppers may be fastened to the frame structure 2 and stop against parts of the cushion 1.

Finally it may be mentioned that even if this pivoting, dynamical head cushion 1 in all cases will return to the initial position determined by the location of the centre of gravity 5 related to the pivoting axis 4, the head cushion may also be provided with other conventional types of biasing, e.g. including springs, to secure a fast return to the initial position.

In fig. 2 a different embodiment is shown in which the head cushion 1 does not undertake a pivoting or tilting movement, but instead undertakes a reciprocating movement, as again assumed by the arrow 9, along a slide 12. The heavier element 3 may in a similar manner be mounted in a corresponding slide 13 or in the same slide 12, so that both the head cushion 1 and the heavier element 3 are free to move both ahead and astern related to the movement of the vehicle. A mechanical connector 6 such as a gear wheel 11 and the racks or the threaded surfaces 14 and 15, connected to or integrated with the respective movable parts, will interlock the movement of the two different elements. For a closer explanation see below.

It should also be noted that stoppers or similar ledges 7 may be included to limit the movement of the cushion 1 and/or the heavier element 3, or a portion of the construction itself may act as a stopper; while springs or similar elastic elements (not shown) may be used to bias the movable system so that it will return to a predetermined and possibly adjustable initial position when it is not exposed to mass forces.

In Fig. 3 it is further assumed that while the head cushion 1 may be slidably fastened by means of at least one slide guide 12 to a frame structure 2 which in turn is directly connected to the chassis of the vehicle, the back 10 of the chair may be resiliently mounted and movable

related to the chassis, and in this embodiment the heavier element or the heavy body 3 may include the chair itself, possibly suspending the user. The action of these arrangements as shown in Fig. 3, will however, be the same in principle as the action of the system shown in Fig. 2, however, it is here also shown how the seat may be locked in a new, thrown back position by means of a spring loaded catch arrangement 16, 17 after a collision from astern. Also in this embodiment the movement of the heavier body 3 (i.e. the chair 10) will be transmitted to the head cushion 1 via the gear wheel 11.

In Fig. 4 it is shown how a one-way acting friction or attenuation device may be incorporated in a headrest of the pendulum type. It should also be mentioned that the body 3 with large mass here is shown at the lower part of the tiltable headrest 1, on a prolonged extension 19 from this. The extension 19 may also act as a stopper or ledge as it meets the back of the chair 10. The attenuation device 18 is built as a one-way acting attenuation cylinder 20 which may be fastened between the frame structure 2 and the part of the tiltable structure 21 of the head cushion, which structure may have the shape of a lever welded to the supporting structure of the cushion 1 close to its pivoting point 4. The attenuation cylinder 20 may be filled by a fluid, i.e. a gas or a liquid in the cylinder, and in this fluid a piston may move as assumed by dotted lines at 23. In the piston 23 or associated with this, a one-way acting valve 24 and a small ventilation opening 25 may be arranged. According to this construction the head cushion 1 may tilt ahead without any substantial friction, while the resistance against being returned at a high speed back to the initial position, will be great. However, a slow return will not lead to much resistance.

When the function of these headrests is to be described, it should in particular be mentioned what the result is if the vehicle is hit from behind. Then the chassis will be accelerated ahead in the direction of the vehicle, and this will lead to a relative movement of the heavier element 3 in opposite direction, i.e. backwards

related to the vehicle direction, due to the mass forces. Accordingly the mechanical connection 6, or 11, 14, 15 between the heavier element 3 and the light head cushion 1, will force the latter astern in the direction of the vehicle's movement. Thereby the object has been met, that the head cushion 1, as a result of the collision will be forced ahead, so that the distance to the head of the user will be reduced or the cushion even touches the head, and accordingly both the angular movement and the velocity of the head in the moment of collision will be strongly reduced. Accordingly the risk for neck damages will also be reduced.

It should be mentioned that the materials of the headrest may be selected freely among lots of usual construction materials when only the mechanical qualities and specific weight are suitable.

Further it should be mentioned that the use substantially will be in connection with motor vehicles of many kinds, including vessels and aeroplanes. However, the invention may also with advantage be used for other devices in which the seat may be exposed to large and sudden accelerations, such as derricks, excavators, etc.

Stoppers and ledges used to limit the movements of the cushion may be used together with biasing devices to return the cushion to its initial position, and such a combination is possible in all the shown embodiments. Further the stoppers and the biasing devices may be implemented in many ways earlier known from different mechanical means. An air spring may, e.g. be used as a biasing device even if not explicitly explained, and of course the stoppers may be arranged on the stationary frame instead of on the movable cushion. Further the slide guidance may be linear or follow a predetermined nonlinear curve.

The frictional or attenuation device 18 may also be arranged in many different ways. The catch device 17, assumed on Fig. 3, will by means of mechanical elements lock the headrest so that it cannot be returned to it initial position without a specific setting, while the fluid piston referred to in connection with Fig. 4, will give a free

tilting of the headrest in one direction while a tilting in return direction only will be obtained rather slowly. Many other solutions may give a similar frictional device dependant of the direction of movement, without leaving the scope of the present invention. Further only one attenuation device 18 may be used, located close to the centre of each head cushion, or two symmetrical arranged attenuation devices 18 may be used, e.g. arranged on each side of each single head cushion. A fluid controlled shock absorber as described above, is assumed to represent a preferred embodiment as it is simple, reliable and gives the desired directional dependent resistance against fast movements.

Finally further modifications may be undertaken, such as having an adjustable initial position of the headrest, adjustable in one or several directions, and at the same time all earlier known setting devices may be used for such adjustments. In a similar manner the mechanical connection may, e.g. be such that the obtained movement of the head cushion is larger than the movement of the heavier element, e.g. as more transmission steps are used in the mechanical transmission.

C l a i m s

1. A headrest adapted for use in connection with seats in a vehicle or a similar movable means, including a head cushion (1) connected to a frame structure (2) which in turn is fastened to the chassis of the movable means, and where the headrest preferably is adjustable,
c h a r a c t e r i z e d in that the head cushion (1), which has a small mass, and an element (3) having a higher mass value, both are suspended movably relative to the vehicle chassis, and that the head cushion (1) is mechanically interconnected to the element(3), by means of a mechanical means (6) in such a manner that when the chassis is accelerated, e.g. due to a collision, then the resulting acceleration of the higher mass, via the mechanical means (6) will give the lighter head cushion (1) an acceleration but in the opposite direction of the element.

2. A headrest as stated in claim 1,
c h a r a c t e r i z e d in that the mechanical means (6) has a transmission exchange which ensures that the movement of the head cushion (1) is increased relative to the movement the element (3) is exposed to during its acceleration.

3. A headrest as stated in claim 1 or 2,
c h a r a c t e r i z e d in that the head cushion (1) and the element (3) are integrated in a common body, which in turn is rotatably mounted to an axis(4) arranged across and above the common point of gravity of the integrated body, so that the body comprises a pendulum unit.

4. A headrest as stated in claim 1 or 2,
c h a r a c t e r i z e d in that the head cushion (1) is suspended in at least one slide (12) so that the head cushion (19) is movable reciprocally ah ad and astern related to the chassis movement, while the element (3) is supported by the same or by a corresponding, parallel arranged slide (13) and the mechanical means (6) which

connects the element (3) to the head cushion (1) comprises a per se earlier known power transmission (11) comprising, e.g. gear wheel(s), belts, levers and/or chains.

5. Headrest as claimed in claim 4, c h a r a c t e r i z e d in that at least one of the slides (12,13) is(are) nonlinear.

6. Headrest as stated in claim 4 or 5, c h a r a c t e r i z e d in that the element (3) is integrated in the head cushion (1), but movable within this.

7. Headrest as stated in one of the claims 1,2 or 4-6, c h a r a c t e r i z e d in that the element (3) comprises a part of the transportation device, e.g. the seat (10) including a user connected thereto (not shown).

8. Headrest as stated in any of the above claims, c h a r a c t e r i z e d in that the movement of the head cushion (1) is limited by means of at least one stopper (7).

9. Headrest as stated in any of the claim 1-8, c h a r a c t e r i z e d in that the head cushion (1) is biased, e.g. by a spring, so that the cushion when the acceleration of the chassis is ended, returns to a pre-determined initial position.

10. Headrest as stated in one of the claims 1-9, c h a r a c t e r i z e d in that the headrest is provided with one substantially one-way acting attenuation device causing that the head cushion (1) only can be accelerated fast in one direction, preferably in the direction leading the head cushion (1) towards the users head, while movement of the head cushion in opposite direction only can take place rather slowly.

11. Headrest as stated in claim 9 or 10, c h a r a c t e r i z e d in that the predetermined initial position of the head cushion may be adjusted by

means of per se earlier known mechanical, hydraulical or pneumatical regulation means.

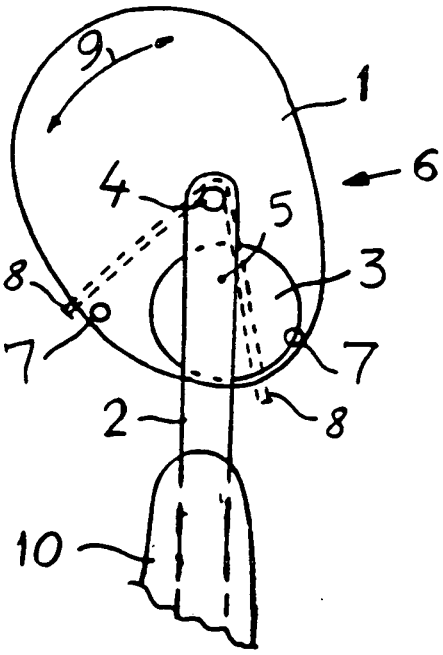

Fig. 1

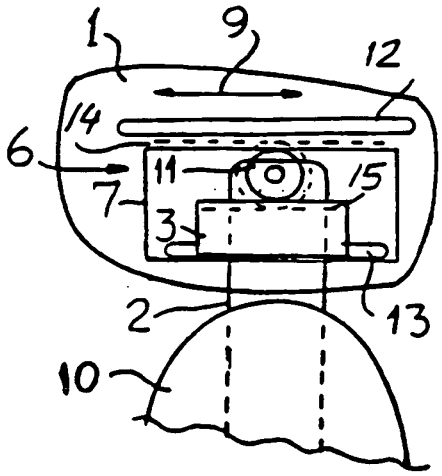

Fig. 2

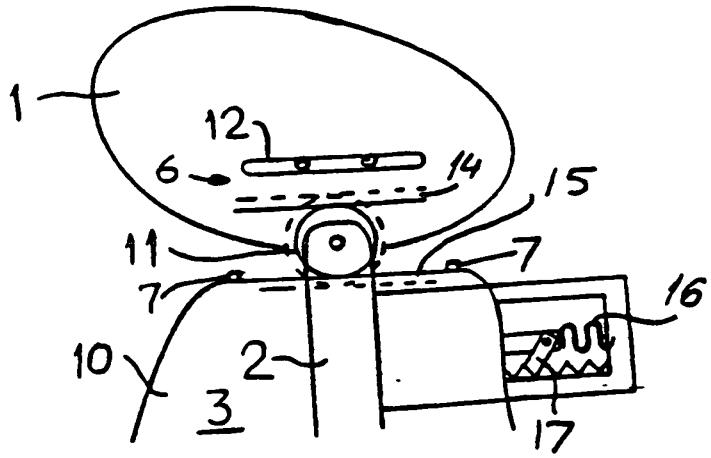

Fig. 3

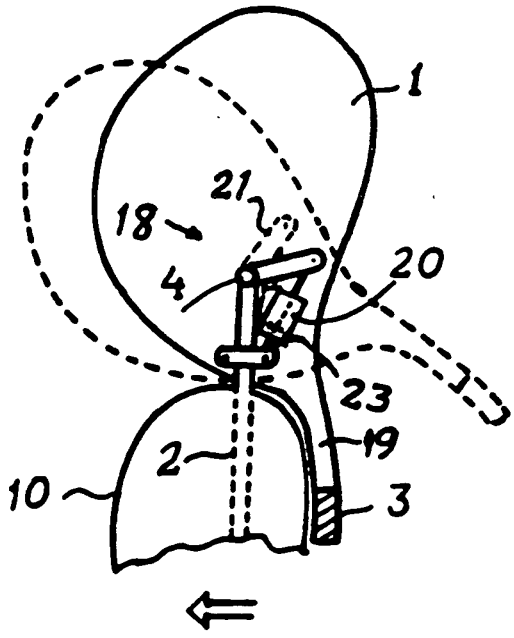

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B60N 2/48
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5181763 A (DELLANNO ET AL), 26 January 1993 (26.01.93)	1-11
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Information on patent family members

07/01/98

International application No.
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